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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/852,376	05/10/2001	Eric A. Jacobsen	884.427US1	5426

21186 7590 08/18/2005

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EXAMINER	
LY, ANH VU H	

ART UNIT	PAPER NUMBER
2667	

DATE MAILED: 08/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/852,376	JACOBSEN, ERIC A.	
	Examiner	Art Unit	
	Anh-Vu H. Ly	2667	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This communication is in response to applicant's amendment filed June 03, 2005. Claims 1-29 are pending.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-29 are rejected under 35 U.S.C. 102(e) as being anticipated by Kadous (US 2001/0036235 A1).

With respect to claims 1, 7, 8, 19, and 25, Kadous discloses in Fig. 1, a functional block diagram illustrating portions of an orthogonal frequency division multiplexing (OFDM) receiver 100. Herein, a signal r(t) is received, synchronized, corrected, deinterleaved, and decoded. It should be understood that in an OFDM system, a signal r(t) or OFDM symbol comprises a plurality of data symbols modulated by different subcarriers and plurality of pilot symbols (receiving an OFDM symbol from a communication channel, said OFDM symbol having a plurality of data subcarriers and a plurality of pilot symbols). Kadous discloses on page 3, 32nd paragraph and Fig. 2, that the least square (LS) channel estimate (pilot vector) is then determined

by performing division on the training sequence (pilot symbols) in LS estimator 56 (generating a pilot vector using pilot symbols from OFDM symbol). Coefficient interpolator and channel estimator then multiplies (dot product) interpolation coefficient for each channel (herein, every channel or subcarrier is considered as an interested subcarrier) (obtaining a first interpolation vector corresponding to a first subscarrier of interest) by the LS estimator to obtain the final channel estimates (calculating a dot product of pilot vector and first interpolation vector to generate an equalization coefficient for first subcarrier of interest).

With respect to claim 2, 9, 17, 24, and 29, Kadous discloses on page 2, 20th paragraph, that the interpolation coefficient (obtaining an interpolation vector corresponding to each subcarrier of interest) or interpolator matrix M is determined and multiplied by an LS estimate for each transmitting antenna to determine the channel estimate for each channel (calculating a dot product of pilot vector and interpolation vector for each subcarrier of interest to generate an equalization coefficient for each subcarrier of interest).

With respect to claims 3, 16, 21, and 27, Kadous discloses on page 3, 32nd paragraph and Fig. 2, that the least square (LS) channel estimate (pilot vector) is then determined by performing division on the training sequence (pilot symbols) in LS estimator 56 (herein, a set of pilot symbols is considered as the all the pilot symbols) (generating a pilot vector includes selecting a set of pilot symbols from OFDM symbol based upon the identities of said subcarriers of interest).

With respect to claims 4, 15, and 22, Kadous discloses on page 3, 32nd paragraph and Fig. 2, that the least square (LS) channel estimate (pilot vector) is then determined by performing division on the training sequence (pilot symbols) in LS estimator 56 (generating a pilot vector includes using all pilot symbols within OFDM symbol).

With respect to claims 5, 14, 18, 23, and 28, Kadous discloses on page 2, 20th paragraph, that the interpolation coefficient is determined by estimating maximum delay, calculating maximum number of multipaths by dividing maximum delay by the transmitted symbol duration, creating a CMPP, and performing a FFT on CMPP to generate a frequency correction factor which is used to determine an interpolator coefficient in the form of an interpolator matrix M(herein, interpolation vectors that each have a length that is equal to the pilot vector). Herein, the matrix is stored for further used in calculating channel estimate (obtaining a first interpolation vector includes selectively retrieving first interpolation vector from a memory).

With respect to claims 6, 10, 20, and 26, Kadous discloses in Fig. 1, a functional block diagram illustrating portions of an orthogonal frequency division multiplexing (OFDM) receiver 100. Herein, a signal r(t) is received, synchronized, corrected, deinterleaved, and decoded. It should be understood that in an OFDM system, a signal r(t) or OFDM symbol comprises a plurality of data symbols modulated by different subcarriers and plurality of pilot symbols. Herein, one or more subcarriers are assigned to a subscriber for modulating the data symbols (identifying subcarriers of interest includes identifying subcarriers associated with a first user within the communication system).

With respect to claims 11-13, Kadous discloses in Fig. 1, a functional block diagram illustrating portions of an orthogonal frequency division multiplexing (OFDM) receiver 100 (communication device is a portable communicator, a base station, or a wireless OFDM receiver).

Response to Arguments

3. Applicant's arguments filed June 03, 2005 have been fully considered but they are not persuasive.

Applicant argues in page 7 that the training sequences are used in Kadous's system, rather than pilot symbols, to generate a vector. Further, applicant argues in page 7 that even if the LS estimator did read on the pilot vector, the result of the multiplication in Kadous is the final channel estimate and not an equalization coefficient as recited in the claims.

Examiner respectfully disagrees. First of all, in OFDM systems, training sequences and/or pilot symbols are preamble symbols and used for phase correction and channel estimation. Therefore, either term can be used. Further, a vector is a one-dimensional array. Thereby, as disclosed in page 3, 32nd paragraph, that the channel estimate de-coupler 58 then decouples the LS channel estimate for each channel. This implies that a vector is created which containing an array of LS channel estimates. As disclosed in page 3, 32nd paragraph that the coefficient interpolator and channel estimator 60 then multiplies (dot product) interpolation coefficient for each channel (herein, every channel or subcarrier is considered as an interested subcarrier) by the LS estimator to obtain the final channel estimates. It should be understood that the final channel

estimates are equalization coefficients to be used in determining channel characteristics in OFDM systems.

Applicant further argues in pages 7 and 8 that Kadous fails to disclose extracting a group of pilot symbols from OFDM symbol to form a pilot vector and performing a mathematical operation using the interpolation vector and pilot vector to generate a first equalization coefficient for first sub-carrier of interest. Examiner respectfully disagrees. As stated in the above rejections, LS channel estimate is determined for each channel. Therefore, a plurality of LS channel estimates is determined for a plurality of channels. Whereby, a plurality of LS channel estimates are arranged to form a one-dimensional array or vector. Further, a multiplication (dot product) is carried out using the interpolation coefficients and LS channel estimates. Therefore, Kadous discloses all the claimed limitations.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Akiyama (US Pub No. 2001/0055296 A1) discloses receiving apparatus for signal transmission system of orthogonal frequency division multiplexing type.

Wu et al (US Pub 2002/0122381 A1) discloses channels estimation for multiple-input-multiple-output OFDM system.

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh-Vu H. Ly whose telephone number is 571-272-3175. The examiner can normally be reached on Monday-Friday 7:00am - 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chi Pham can be reached on 571-272-3179. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

avl

CHI PHAM
SUPERVISORY PATENT EXAMINER
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